SECRET

File copy
Return to Branch Office C 11

R&A No. 1060

097.3
Z1 092
No. 1060

NORWAY - STRATEGIC AREAS

28 July 1943

DEPARTMENT OF STATE
REFERENCE DIVISION
FILE COPY
PLEASE RETURN
REF

OFFICE OF STRATEGIC SERVICES

Branch of Research and Analysis

SECRET

NORWAY -- STRATEGIC AREAS

Table of Contents

I. Norway south of Namsos

A. Stavanger-Bergen area

B. Andalsnes-Trondheim-Namsos Area

II. Norway north of Namsos

A. Tjötta

B. Bodö-Rognan

C. Narvik-Bardufoss

D. Alten-Banak

E. Kirkenes Region

SECRET

NORWAY - STRATEGIC AREAS

Introduction

1. General

Elongated Norway is strategically divisible into two parts: 1) the region south of Trondheims Fjord; and 2) the interrupted coastline north of the same fjord. The southern area contains the Oslo district, the heart of Norway from almost every point of view, and an ultimate objective for any invading force. Northern Norway, scarcely more than a series of small isolated communities, is important only in its proximity to the northern sea route to Russia.

In both regions rugged topography will be an important controlling factor for any offensive operation. Not only will overland movement be generally constricted to valley routes, but existing airfields will have to be taken before land based planes can be used. The Germans have developed at great expense strategic airfields on or near the few possible airfield sites, and near all of the important entrances to interior Norway.

The coincidence of airfield sites and entrances to natural routes toward the interior makes possible an easy delineation of strategic areas. In southern Norway they are: 1) the Stavanger-Bergen area; and 2) the Andalsnes-Trondheim-Namsos area. Both these areas provide access to the Oslo region, but only the Trondheim entrance provides even a reasonably good route. The Skagerrak and Oslo Fjord coasts are not considered because of their nearness to continental Germany.

Northern Norway contains five small areas, all centered on airfields: 1) Tjötta; 2) Bodö-Rognan; 3) Narvik-Bardufoss; 4) Alten-Banak; 5) Kirkenes.

2. Airfields

The airfields of Norway outside the Oslo area fall into two well defined location categories: 1) those on the coast, and 2) those inland some distance, at or near the heads of fjords.

Only one Class I field (suitable for all types of planes) is on the coast, Sola field near Stavanger. Nearby is Forus, a Class II field. To the north, near Bergen, is Herdla, a Class II field, used by fighters on Herlö Island, off Bergen. Still farther north are the smaller Class III fields of Alesund and Oessen. At the mouth of Trondheim Fjord is Storfossen, a small Class III field for light planes. Nearby is the Class II field of Orlandet, reported suitable for all types of aircraft. North of Trondheim about 150 miles, Tjötta field, on an island off the coast, provides a small Class III field for fighters. About 100 miles farther north is Bodö, a Class II field, soft, but reported suitable for most heavy planes. North of this point the land fields are not close to the open sea, being at the heads of fjords or protected by extensive islands.

The remaining fields, at or close to the heads of fjords, are not as accessible from the open sea as the former group but comprise the larger number of fields. The greatest concentration is around Trondheim, including the important Class I field of Vaernes and three neighboring fields of Class II and III. Other Class I fields and neighboring smaller fields are at Bardufoss, north of Narvik, at Banak

near the North Cape, and at Hoybuktmoen outside Kirkenes near the Finnish border.

All of these fields can be reached from the sea, but with some difficulty, since either long, narrow fjords or winding roads through narrow valleys or across rough uplands must be followed. In many cases an amphibious combination of land and water routes must be used, since many roads have ferry gaps.

I. NORWAY - SOUTH OF RAMSOS

A. STAVANGER - BERGEN

From Stavanger north to Alesund the coast is deeply indented with fjords, backed by mountains and high plateaus and generally has poor access to the heart of Norway, the Oslo-Trondheim axis. A major airfield at Stavanger lies close to the coast and a class II airfield provides a fighter base at Herdla on an island near Bergen.

1. Objectives

a. Airfields

1) Stavanger area. a) Sola. Best airfield in Norway; long concrete runways used by all types of planes, and full servicing facilities. Seven miles south-southwest of Stavanger. Nearby dummy: Sandnes. b) Forus. Originally intended as an important bomber base, but not fully used because of difficulty caused by settling of runways in soft ground. Now used mainly as an assembly and repair base for all types of planes. Located 5 miles south-west of Stavanger.

2) Bergen area. a) Herdla. Used by fighters protecting Bergen. On north end of Herlö Island, 20 miles north-northwest of Bergen. b) Voss-Bomoen. Used only occasionally by fighters. Definitely less important than Herdla. Forty-three miles north-northeast of Bergen.

b. General Objectives

1) Bergen. Most important port on the west coast of Norway. Deep Harbor; quayage for 6 large ships and many small ships and anchorage for many others of all sizes; submarine base; can handle several thousand tons of cargo daily.

2) Stavanger. Fourth most important port of Norway; accomodations for about 6 ships at quays; can clear at least 2,000 tons of general cargo per day.

3) Haugesund. Deep water, secondary port between Bergen and Stavanger with quayage for several large freighters.

4) Bergen - Oslo Railroad. Only rail link between west coast and Oslo outside Trondheim; cutting it would isolate Bergen. Close to Voss-Bonoen airfield. Numerous tunnels, bridges, and snowsheds.

2. Pertinent Landings

Landings can be made at the ports of Stavanger, Haugesund, and Bergen, at several small ports at the heads of fjords, on some beaches, the best of which are near Stavanger Peninsula.

a. Stavanger area.

1) Jaeren beach, on the west coast just south of the Stavanger Peninsula is by far the largest and probably the best beach in Norway. It starts at Vigdalnes, 10 miles south-southwest of Stavanger, and extends 30 miles south along a straight coast without major identations. It is a smooth beach, bordered by sand dunes and backed by low undulating land, rising in some places to hillocks.

2) North of Jaeren beach, there are several other good beaches, including a 3-mile stretch just west of Sola airfield, along the east and south sides of Havsfjord north of Sola, and small beaches farther north on the peninsula. On the east side of the peninsula, there is a beach about 3 miles south of Stavanger.

3) The port of Stavanger, Norway's fourth largest, is accessible to vessels of all sizes, and has about 4300 feet of quayage for deep-draft ocean vessels, and 2300 feet for ships of 16-24 feet draft. Daily unloading capacity is up to 4000 deadweight tons of general cargo, and the port is served by a road net leading to Sola and Forus airfields.

4) Additional landings may be made at wharves for small coasting vessels at minor ports in Boknfjord, north of Stavanger. These landings have poor land connections to the interior and none to Stavanger.

b. Haugesund area. The secondary port of Haugesund and several minor landing places on the fjords on either side of the broad peninsula on which Haugesund stands have road access through to the interior.

c. Bergen area.

1) Herdla airfield, on the northern half of Herlø Island, a small island at the junction of Hjeltefjord and Herlafjord, about 16 miles northwest of Bergen, is reached by sea through narrow passages between an outer line of islands, or up Herdlafjord from Bergen. The island is low, the highest point being about 100 feet above the sea on the southern half of the island. There are several piers suitable for landing of small boats on the island.

2) Bergen, largest port on Norway's west coast, is particularly important as the only port on a long stretch of coast with railway connection and roads to the interior. There is deep water quayage for four or more large ships and considerable additional quayage for moderate-sized vessels. Several thousand tons of general cargo can be unloaded daily.

3) Several low coastal points and islands with wharves for small steamers provide a few additional landings places from which some objectives may be reached.

3. Terrain and Routes

The coast north of Stavanger is cut by many broad deep fjords and backed by a high mountain-capped upland (fjeld) which obstructs movement east to the heart of Norway. Only the Stavanger-Haugesund area and Bergen have either road or rail connections through to the interior.

a. Stavanger area. A local system of roads on the Jaeren lowland, a fairly level area, uninterrupted by fjords for 70 miles south of Stavanger, connects Jaeren landing beach with Stavanger and with Sola and Forus airfields. The main highway is within 4 miles of the coast at practically all points, and numerous side roads, together with flat to gently rolling terrain, offer opportunities for deployment and movement away from main routes.

From Boknfjord, north of Stavanger, units could move eastward by poor winding mountain roads to the interior and eventually connect with routes to Oslo.

b. Haugesund area. From Haugesund, one through road extends inland toward Oslo; a second connects with the mainland by means of a ferry from Ropeid to Sand, 35 miles east of Haugesund.

c. Bergen area. Bergen is on the western side of a triangular peninsula, the western side of which is served by a network of minor roads. The higher and more rugged eastern side has no road net but is crossed by the Bergen-Oslo railway and road, both of which have heavy grades in the interior of the country.

Voss-Bomoen airfield is reached from Bergen by the railway and main road, or by a long water route from the vicinity of Haugesund up the narrow Kvinnhered and Hardanger fjords.

4) Additional landings may be made at wharves for small coasting vessels at minor ports in Boknfjord, north of Stavanger. These landings have poor land connections to the interior and none to Stavanger.

b. Haugesund area. The secondary port of Haugesund and several minor landing places on the fjords on either side of the broad peninsula on which Haugesund stands have road access through to the interior.

c. Bergen area.

1) Herdla airfield, on the northern half of Herlö Island, a small island at the junction of Hjeltefjord and Herlafjord, about 16 miles northwest of Bergen, is reached by sea through narrow passages between an outer line of islands, or up Herdlafjord from Bergen. The island is low, the highest point being about 100 feet above the sea on the southern half of the island. There are several piers suitable for landing of small boats on the island.

2) Bergen, largest port on Norway's west coast, is particularly important as the only port on a long stretch of coast with railway connection and roads to the interior. There is deep water quayage for four or more large ships and considerable additional quayage for moderate-sized vessels. Several thousand tons of general cargo can be unloaded daily.

3) Several low coastal points and islands with wharves for small steamers provide a few additional landings places from which some objectives may be reached.

3. Terrain and Routes

The coast north of Stavanger is cut by many broad deep fjords and backed by a high mountain-capped upland (fjeld) which obstructs movement east to the heart of Norway. Only the Stavanger-Haugesund area and Bergen have either road or rail connections through to the interior.

4. Climate

Although the sky is on the average from one-half to three-quarters covered, cloud ceilings are usually high enough for general air operations, and are high enough for high level bombing on half the days, even in winter. Best cloud conditions are found in April when two-thirds of the days have unlimited ceilings. Operations are occasionally prevented in winter by gales. Visibility for reconnaissance is very good most of the time and is best in the warmer part of the day. Only occasionally is visibility poor enough to aid surprise operations, and there is no true night from mid-May to the end of July.

Landing operations would encounter favorable general offshore winds more often in winter than in summer, but early morning local offshore winds occur on about one-third of the days from May to August. A combination of gentle breeze or calm, with calm or slight sea, prevails half the time in early summer. The prevailing winds are parallel with the coast: from northerly quarters in summer, southerly in winter.

Ground operations are hampered at all seasons by the heavy rain, which reaches its peak of 8 inches a month in autumn. Along the coast, two out of every three days have precipitation. Rainfall decreases toward the heads of fjords. In winter the ground is seldom frozen or snow-covered except inland on the upland plateau or fjeld. Spring floods normally reach their peak at the end of May.

B. ANDALSNES - TRONDHEIM - NAMSOS AREA

The Trondheimsfjord region provides the best access on the west coast to Oslo, the heart of Norway. It is also the site of several major airfields as well as of an important German naval base. From Trondheim and Andalsnes good road and railway routes extend directly down through valley corridors southward to the Oslo region. The shores are lined with several ports, including Trondheim, third port of Norway. The Nordland Railway and the Northern Trunk Road, principal land connections between north and south Norway, follow the south and east shores of the fjord for a considerable distance, and several valley routes lead eastward to Sweden.

1. Objectives

a. Airfields. The airfields may be classified, by location, as (1) those located near the coast and accessible directly from the sea, and (2) those on the shores of fjords and at inland locations. The greatest concentration of fields in the region is in the immediate vicinity of Trondheim, including the two very important fields at Vaernes and Trondheim. The principal airfield objectives are as follows:

1) Coastal Airfields. Fields near the coast are: (a) Alesund, reported as a principal base and seaplane landing, near Port of Alesund, but no detailed information available; (b) Gossen, a field with two long runways reported to be in early stages of construction in summer of 1942, at the northwest end of Gossen Island, 12 miles northwest of Molde; (c) Storfossen, a small field suitable only for light planes in middle of Storfossen Island, 35 miles west-northwest of Trondheim field, at the entrance to Trondheimsfjord; and (d) Orlandet, a good field for all types of aircraft, on a narrow, level peninsula 1.5 miles northwest of the

town of Örlandet between Bjugnfjord and Skjornfjord, near entrance to Trondheimfjord. Several large islands west of the entrance to Trondheimfjord are level, and might provide sites of additional airfields.

2) Fjord and Inland Fields. Airfields at fjord and inland locations are: (a) Vaernes, one of the most important fields in Norway, with good long concrete runways and full facilities for all types of planes, located 1.2 miles northeast of Hell railway station and 17.5 miles east of Trondheim, near the east end of main portion of Trondheimfjord, (b) Trondheim, second to Vaernes in importance in the region, located on a promontory jutting into Trondheimsfjord 2 miles east of Trondheim city, with a single runway but full facilities, and barracks for several thousand troops; (c) Oyesand, with a single unsurfaced runway suitable for fighters, located near southeast end of Gaulosenfjord on peninsula separating the Gula River from Bukiven; and (d) Rinnleiret, an emergency field on which work was reported in progress in December, 1942. Located on east bank of the Rind estuary five miles east-northeast of Levanger. In addition, there are a number of fields of lesser importance.

b. General Strategic Objectives

1) Trondheim, an important city, port, and naval base, with excellent road and rail connections; the third largest port of Norway, with excellent shelter and well provided with deep water quayage for the largest ships. The port can clear at least an estimated 2,200 tons of general cargo daily.

2) Namsos. A secondary port and timber town; important because of its rail and road connections with the interior and with Trondheimsfjord.

3) Nordland Railway and Northern Trunk Road. Principal rail and road connections between north and

south Norway. Important junctions of both highway and railway lines are: in the north, at Grong, from where routes lead west to Namsos and northward; and Hell, near Trondheim, junction of routes leading into Sweden.

4) Dombas and valley route leading south. Dombas is a junction of road and rail routes from Andalsnes and Trondheim and the main rail and road routes leading south to Oslo.

2. Landings with Exit Inland

The landing places may be classified as (a) those within Trondheimsfjord, nearest to the principal objectives, (b) those to the north, in the vicinity of Namsos, and (c) those to the southeast, in the Andalsnes area.

a. Trondheimsfjord. Trondheimsfjord provides the best natural area along the west coast of Norway for landing operations. It has many suitable beaches, once the defenses guarding the entrance to the fjord are passed. Entrance normally presents no unusual difficulties. Within the fjord there are several good anchorages with good holding ground and no tidal currents. Parts of the south and east shores of the fjord are lined with beaches. The largest are on the delta of the River Gula southwest of Trondheim, and to the east of Trondheim along part of the shore, especially at the mouths of the rivers Stjordal and Vaerdal (near Vaernes and Rinnleiret airfields, respectively). Three beaches are located on the south shore of Skjornfjord, a branch fjord on the north side of the entrance to Trondheimsfjord, across from Orlandet airfield. The low peninsula occupied by Orlandet field apparently also can be landed on from either side. There are also a number of other beaches suitable for landing in other parts of Trondheimsfjord and its arms.

The ports of Trondheimsfjord and its tributaries

that may be used for landings from ocean-going ships at quays, in addition to Trondheim, are Levanger and Steinkjaer, both on the main railway and highway between Trondheimsfjord and the north. Several other ports have quays that may be used for landings from smaller vessels, and large ships can anchor off shme of the beaches.

b. Namsos area. From the Namsenfjord area north of Trondheimsfjord, several railway, highway, and other natural routes, following the southwestward "grain" of the country, lead to Trondheim and the major objectives. There is ample depth in Namsenfjord for all sizes of vessels. Although the bordering slopes are moderately steep and high, there are a few small landing places, of which the best are the port of Namsos and nearby beaches. Namsos port, however, is not well adapted to the landing of general military cargo, although ships of up to 31 feet draft may berth at highest tides. There are several good anchorages.

c. Andalsnes and the southwest area. To the south and southwest of Trondheimsfjord is an area of high and deeply dissected plateaus, into which penetrate a number of long, narrow, steep-sided fjords. Landings may be made at various points along the coast and on the coastal islands, but there is only poor access inland, except by water up the fjords. The heads of the fjords, if the fjord entrances can be penetrated, offer opportunities for landing on the relatively flat deltas, some of which offer access up river valleys to the interior. Landings may be made at the ports of Alesund and Andalsnes.

3. Terrain and Routes

The routes from the landing places to the major objectives are (a) from the sea by water through

Trondheimsfjord, (b) from the Namsos area on the north, and (c) from the Alesund-Andalsnes area on the south.

a. Trondheimsfjord area. The Trondheimsfjord area proper is characterised by low mountains and valleys in the vicinity of the fjord, and is more easily travelled than the higher and more rugged areas to the north and south. Except for the high coastal mountains, the Trondheimsfjord region is relatively well suited for the movement of troops, and there is relative freedom of movement independent of main roads in the lowlands and lower stream courses. Movement across country from valley to valley is possible in many places, and light equipment can deploy or use alternative routes if main roads are blocked. Winter operations may be difficult; the best season is April to September.

The fjord is deep, about 70 miles long and 1 to 13 miles wide. The entrance is 2 to 3 miles wide and about 20 miles long, forming a rather narrow passage. The principal land routes, in general, follow the shores of the fjord and its branches, and the stream valleys leading into the fjord.

b. Namsos area. From Namsos there are two principal routes to the Trondheimsfjord, converging at Asp, near the northeast end of the fjord. South of Asp they follow the shores of the fjord to the major objectives, including Trondheim.

The principal route, the Northern Trunk Road, is generally good, with width between 13 and 16.5 feet and with moderate gradients.

A branch from the main road extends from Namsos up the Nams Valley, connecting at Grong with the main road.

From Grong the road reaches the head of Beitstadfjord, the northeastern arm of Trondheimfjord,

at Steinkjaer.

The Nams Valley route from Grong crosses a low divide to Snaessen Lake and thence to Asp. It is nearly 22 miles shorter than the main road between Asp and Grong, but is only 10 to 12 feet wide and poorly surfaced. Maximum gradient is 1 in 7. The road is closely paralleled by the standard-gauge Nordland Railway, including a branch line from Grong to Namsos.

c. Alesund and the southwest area. Several possible routes lead to Trondheimsfjord overland from the Alesund-Andalsnes area. The port and seaplane base at Alesund, on an island near the coast, are objectives that can best be reached from the sea. Alesund is the terminus of a road to the south side of Romdalsfjord, from which Andalsnes, another minor port, may be reached by ferrying across the fjord. An alternative route is up Storfjord to Sylt, from which a road crosses the divide northeastward to Andalsnes. It is good and mostly new. Width is 14.5 feet, and there are passing places.

From Andalsnes the standard gauge Rauma Railway and a good road extend up the Roms Valley to Dombas and provide the best route inland in the area. At Dombas connection is made with the main road and rail route from Oslo to Trondheim. A lowland route, following the Driv and other valleys, leads northward to Trondheim, and another lowland route southward to Oslo. The Andalsnes-Dombas road is well built with easy grades, but there is danger of avalanches, especially in Spring. The Oslo-Dombas-Trondheim road is also good.

There are similar, but somewhat more hilly, roads up the Rinn Valley, the Sunn Valley and some lesser valleys, from the heads of long, narrow fjords.

The valleys in the area, in general, have relatively wide and flat floors, being U-shaped. The circuity of the routes and lack of possible cross-country routes off the roads between the valleys, however, restrict the possibility of approach from the south to the objectives in the Trondheim area.

4. Climatic Features

Although cloudiness is great, general flight operations are usually possible at all seasons because ceilings are seldom below 1,000 ft.. High altitude bombing is limited by the frequency of overcast skies, but reconnaissance is aided by the generally good visibility in the lower air strata. There is no true night from the end of April to mid-August.

Landing operations are favored by offshore winds from a third to half the time throughout the year. Fog provides concealment for landing operations on only a few days a month, and is more frequent offshore than along the immediate coast in summer.

Ground operations would be retarded by rain on almost half the days except in winter. Snow cover would hamper movement from December to March, especially back from the coast, around Trondheim. The ground is frozen at Trondheim much of the time from late November to late March. April is a month of thawing, and early June is the usual time for the culmination of stream floods from melting snow.

SECRET

II. NORWAY NORTH OF NAMSOS

A. TJÖTTA

The Tjötta area is important because it contains anairfield close to the sea, the only field on a 175 mile stretch of coast. The Tjötta field is about 100 miles north of Namsos and about 150 miles north of Trondheim.

1. Objectives

a. Airfields

(1) Tjötta on the southwest side of Tjötta Island at the mouth of Vefsnfjord, a small airfield with a grass runway suitable for fighter planes.

location wrong on map?

(2) Hatfjelldalen, a class III refuelling and emergency field in the interior for short-range aircraft operating between Trondheim and the north.

b. General Strategic

1) Mosjoen, a timber and fishing port at the head of Vefsenfjord, on the north-south road and railway.

2. Landing Places

Tjötta is a low and swampy island. The highest point is 240 feet. Landings may be possible on the island. At the town Alstabaug, about 10 miles north, and at other points on the island of Alsten, there are sandy beaches where landing is easy. Bridges carry a road from these beaches on Alsten to Tjötta.

Mosjoen, at the head of Vefsenfjord, has quayside accommodations for average ocean freighters, as well as several smaller vessels, permitting landings from lighters.

3. Routes and Terrain

Approach to Tjötta is endangered by islets and rocks; normally the best approach is from the south. Approach from other directions is also possible. On the north narrow fjord channels have strong currents.

Mosjoen can be reached directly from the sea only by the Vefsenfjord, although a road is reported under construction from Tjötta to Mosjoen along the northern side of the fjord. The fjord is about 30 miles long and about 2 to 3 miles wide. Hatfjelldalen is 47 miles southeast of Mosjoen by road. The route follows the fairly good north Trunk road down the narrow wooded Björndal Valley to Fellingfors where a narrow, steep road, in fairly good condition, leads to Hatfjelldalen.

4. Climate

In winter general flight operations are occasionally prevented by gales. The sky is overcast frequently, and on summer mornings conditions are especially unfavorable for high level bombing because cloud bases are below 1,000 ft. a quarter of the time. Aerial reconnaissance is possible most of the time because visibility is generally very good; a condition that also discourages surprise operations. There is no true night from late April to late August.

Landing operations are favored on perhaps half the days in July and August by gentle or no wind, or swell. In late autumn and winter, offshore winds provide fairly favorable conditions for landing on half the days. Fog is most frequent in summer: on about 5 days a month at sea in July, but only half as often near shore.

Ground operations will encounter heavy rainfall in autumn, and moderate precipitation the remainder of the year. Alternate freezing and thawing of the soil occur throughout the winter.

B. BODÖ - ROGNAN

This area is important because it has an airfield close to the open sea. The field is only about 130 miles southwest of Narvik and 300 miles up the coast from Trondheim and its key airfields.

1. Objectives

a. Airfields

1) Major field 3/4 mile southeast of Bodö is class II field with full facilities; suitable for heavy aircraft. Field is soft and peaty, but runways are long and wide.

2) Class III field, 30 miles east, at head of Saltdalsfjord, is small and used by light aircraft. Probably intended as an emergency field in conjunction with Bodö field.

b. General Strategic. Bodö, a secondary port on the north side of the entrance to Saltfjord; the north-south highway, about 30 miles east of Bodö near head of fjord.

2. Landing Places

Good landing places are available close to Bodö airfield. Port of Bodö is a secondary port capable of berthing medium-size vessels. It is well protected by offshore islands and has a good anchorage. Landings can also be made just northeast of the town (1800 yard beach), on the western tip of the peninsula 2 miles southwest of the town (4 mile beach), as well as on several points along the northern coast of Saltfjord. Some possible landing places along the south coast are low and boggy. At the mouth of Saltdalenfjord, about 40 miles from the open sea, is a good landing place close to the small airport and the north-south trunk route.

3. Terrain and routes

The coast of the Saltfjord region is generally steep, rising 1,000 to 3,000 feet close back from the

water edge. Three low promontories and four small deltas are exceptions. Bodö airfield lies on the western promontory, near the open sea, and surrounded by relatively flat land. The only limiting factors in natural access to the field are the offshore rocks and reefs (skerry). Rognan, on the other hand, lies at the head of the inner fjord, and can be reached only with difficulty: (1) by water along the fjord (narrow passages, strong currents); (2) overland through Salt valley by the road from Mo on the south; (3) from Bodö by a narrow road (generally less than 16 feet wide) following the steep northern shore of the fjord to the north Trunk Highway. The road has solid foundations, but is one-way in places, and is interrupted by short ferry crossings. Much of the low land adjacent to this road is boggy.

4. Climatic conditions

Air operations are prevented at times in winter by strong winds and occasional gales, especially over the sea. Mean cloud cover is great, and about a third of the days are overcast. Visibility is generally good, but the long winter nights favor surprise operations. There is continuous daylight during the period from June 12 to 29.

Landing operations are favored by offshore winds more than half the time in the cooler half of the year, and a third of the time in the warmer half. Calms are frequent in summer, but infrequent in winter. Landings are prevented by gales only occasionally.

Ground operations would have frozen ground from late November to early April, and on most days of this period there is snow cover which is at times deep enough to hamper movement of equipment. The thaw begins in early April.

C. NARVIK - BARDUFOSS AREA

As the only area with rail connection inland to Sweden, and as the site of three airfields, the Narvik-Bardufoss area is strategically the most important of northern Norway. The area is located about 300 miles southwest of North Cape and about 350 miles north of the Trondheimsfjord area.

1. Objectives

a. Airfields

1) Bardufoss, an excellent field with concrete runways and full facilities, suitable for all types of aircraft except the heaviest bombers, located approximately 52 miles northeast of Narvik;

2) Elvenes (Salangen), a fighter field with cement runways and permanent installations, located 34 miles northeast of Narvik and 3.5 miles east of Salangen;

3) Skanland, a small emergency field unsuited for operational units, 23 miles west-northwest of Narvik on the east side of the channel between Hinnöy and the mainland.

b. General Strategic. The port of Narvik, on a low promontory near the head of Ofotfjord, is an important iron ore shipping port -- being the terminus of the electrified railway from the Kiruna mines in Sweden. Narvik is the only northern Norwegian port with rail access inland, and to the Baltic.

2. Landings

a. Ofot (Narvik) Fjord. Several beaches on low-lying promontories within the fjord, from which roads on both sides can be reached. In the immediate neighborhood of Narvik landings of small parties could

be made on almost every part of the shore.

b. Skanland vicinity. Beaches at Skanland town, immediately south of it, and near the terminus of the Harstad ferry. Navigation in the Tjeld Sound, on which Skanland lies, dangerous because of sunken rocks and shoals, strong tidal streams, and whirlpools.

c. Asta Fjord to Solberg Fjord. Landings can be made on the deltas at the heads of all tributary fjords, from which access to the north-south trunk road and Salangen field is easy. Landings are also possible on the low or gently sloping shore between Solberg and Salangen fjords.

d. Offshore (Lofoten and Vesteralen) Islands. If success of the operation demands occupation of the offshore islands, landings also can be made on them. There are several stretches of low cultivated land bordering their shores. The eastern coast of the Vesteralen group is especially favorable; however, coastal areas and inland valleys are locally boggy.

3. Terrain and Routes

This area is one of low mountains. Elevations rarely exceed 4000 feet, and a number of deep valleys criss-cross the region but narrow fjords must be traversed in order to reach these routes. The main road follows a series of these valleys, roughly parallel to the coast, and 15 to 20 miles inland. It is narrow and has some steep grades near passes connecting successive valleys. Branch roads extend to the coast at 10 to 20 mile intervals. Highways and natural corridors run to or near all inland airfields.

Movement eastward from the area would be facilitated by the Ofot railway, a well-built electrified standard-gauge line, whose grades do not exceed much more than 2%.

It is used primarily for the transportation of iron ore from Sweden to Narvik, and is connected with the Swedish railway system.

4. Climate

General flight operations would encounter low wind velocities with few gales, although velocities are higher over the islands. Visibility is generally good for reconnaissance, but is occasionally decreased by fog over Vest Fjord. The sun is above the horizon continuously from May 21 to July 22, and there is no true night from mid-April to early September. Cloud cover is great, but the ceiling is usually high enough for flying.

Landing operations would be concealed by poor visibility only occasionally. However, in winter, nights are long, and the sun is below the horizon from December 2 to January 11.

Ground operations would encounter low temperatures, frozen ground, and deep snow in winter. Snow begins to accumulate on the ground in November and averages more than a foot deep even in April. The snow begins to melt in late April, and the ground continues to thaw in May.

D. ALTEN - BANAK

This area, located 80 - 100 miles southwest of the North Cape, contains Alten and Banak airfields, at the heads of adjacent fjords, about 40 miles apart. These fields are bases for operations over the northern sea route to Russia.

1. Objectives

a. Airfields. Banak, at the head of Porsangerfjord, is an important base for bomber and reconnaissance planes. It has permanent installations. Alten, at the head of Altafjord, is a small fighter field.

b. General Strategic Objectives. The North Trunk Road, principal land route in the area, connects the two fields with each other and with south Norway. The island port of Hammerfest, which can accommodate several moderate-sized ocean freighters, is connected with the North Trunk Road and the airfields by a branch road.

2. Pertinent Landings

Parts of southern Porsangerfjord, especially the head of the fjord, are low and in many places swampy, with extensive beaches and forests. There are several small level islands near the head of the fjord. At the head of Altenfjord the Alta River has built up extensive beaches. There, as well as on other deltaic flats in this fjord, landing places are favorable.

3. Terrain and Routes

The land rises abruptly to a general level of 1500 - 2000 feet with some points over 3500 feet.

The uplands are barren and the valleys generally covered by birch forests. Alten and Banak can be reached (1) by sea through long fjords with narrow channels; (2) by land southward from Hammerfest, which is near the open sea. A road from Hammerfest joins the North Trunk Highway, connecting Alten and Banak. The Hammerfest road is 56½ miles long, has one short ferry gap, varies in width from 11 to 13 feet and has a dirt and gravel surface. Portions of road are cut in solid rock, but there are no unusually steep grades. The North Trunk Road cuts northeastward from Alten over upland to middle of Porsangenfjord and follows western shore south to Banak (distance Alten - Banak 112 miles). The road is new and gravel surfaced, and portions along fjords and in valleys leading to upland are probably very narrow (one-way). Sections through upland cross extensive marshy tracts.

4. Climate

Visibility near the coast is general ly good, with poor visibility occurring only 1 to 4 times per month, and true fog once or twice a month in summer and rarely in winter. In the interior, fog is somewhat more frequent in both winter and summer. From late November to mid-January the sun does not rise above the horizon, and from mid-April to early September there is no true night. Gales are infrequent and wind velocities low. Although cloud cover is great it seldom prevents general flight operations because the cloud base is usually above 1000 feet.

Landing operations would be aided by the high frequency of calm (from 25 to 42 percent of the morn-

ings from April to September). In winter, fogs are much less frequent. Surprise is discouraged by the good visibility, and in summer by the lack of night.

Ground operations would encounter frozen, snow-covered soil throughout winter and early spring; snow cover would be deep enough to seriously hamper motor transport December through April. The thaw in May and early June would be a further handicap. Rainfall is light: less than two inches per month even in summer, the wettest season.

E. KIRKENES AREA

The Kirkenes area is located along the Finnish border less than 100 miles from Murmansk and contains bases for planes operating against the northern sea route to Russia.

1. Objectives

a. Airfields. The only major airfield is Hoybuktmoen, 4 miles west of Kirkenes, an important field available for all types of planes except possibly the heaviest bombers. Karlbotn, at the west end of Varangerfjord, 45 miles northwest of Kirkenes, is an emergency field and possibly an auxiliary to Hoybuktmoen. Additional fields are located along the lowland interior on the Finnish side of the border.

b. General Strategic Objectives. Kirkenes, the largest port of Arctic Norway, has a deep harbor and can accommodate large ships. Five miles south of the town are iron mines, connected with the port by railway. Kirkenes is the terminus of the Northern Trunk Road.

2. Landings

Many landings can be made in this area. The coast is low at Kirkenes and at many other points along the fjords to the north of Kirkenes. The Hoybuktmoen airfield can be reached by road from landing areas at the heads of the fjords to the west. Landings may be made at and near the heads of Laskefjord, Tanafjord, and Varangerfjord, near the road to Kirkenes, and near the town just east of the airfield.

Landings may be made at head of Varangerfjord near Karlbotn airfield.

3. Terrain and Routes

The region is a barren plateau about 1,000 - 1,500 feet high, dissected by deep fjords and wooded river valleys extending inland from the heads of the fjords. The fjords are generally steep-sided, but have some gently-sloping areas and beaches suitable for landing. The coast outside the fjords is sheer and rocky.

All objectives are along the Northern Trunk Road, which is of recent construction and generally fairly good, but with long poor stretches. It is dirt and gravel on stone foundation, with width from 11.5 feet to 16.5 feet, and with steep grades leading from fjords and valleys to upland. It is difficult to keep open in winter.

4. Climate

In winter, coastal landing and aerial operations would be hampered by frequent violent winds, though the direction of the winds -- 80 percent offshore -- is fairly favorable for coastal landings. Ground operations would encounter persistent very deep snow from late November to mid-May, and very low temperatures. Surprise is favored by the long nights and by the occurrence of poor visibility on one out of three days. Even in winter the outer coastal waters are ice-free, though inner reaches of the Varangerfjord freeze for two or three miles from the head.

In summer, coastal landings and aerial operations

are favored by the gentler winds, though only about 30 percent are offshore. The continuous daylight (no true night from April 10 to September 1) and good visibility of this season favor precision bombing and shelling, but reduce the possibility of surprise operations. Cloudiness is great at all seasons (7 to 8 tenths mean sky cover), giving cover to aerial operations, both of offense and defense, and ceilings are usually high enough to permit aerial reconnaissance and low-level bombing.

May and September are the months of transition between winter and summer wind conditions. Mud from thaws is an unfavorable factor for ground operations in May and June.